A chemical probe for characterizing turbulent micromixing

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Résumé en anglais	Micromixing strongly affects the molecular-scale contact of chemical species in numerous chemical reactions. Understanding the mechanisms governing micromixing lets us explain the relationships between the turbulence structure and the selectivity of the reaction. The micromixing models in the literature for large Schmidt numbers (Sc~1000) are of two sorts: stochastic models (principally the Curl model) and deterministic models (such as IEM and the “engulfment” model). These models are essentially based on phenomenological considerations and on the properties of small-scale eddies related to the micromixing time. Micromixing can be quantified locally by analysing the products of a local chemical reaction if this reaction is “fast” compared to the micromixing time. This so-called chemical probe method is used in the present work, following the Villermaux method [1] on the [iodide/iodate] chemical reaction. A numerical study is carried out here to compare the different micromixing models with the experimental results of Fournier [2] in a stirred tank. In order to compute the concentrations, mass transfer equations including a reactive term are solved by a pdf model using a Monte-Carlo method. A benchmark proposed here for the micromixing models shows that the engulfment model is the more efficient in evaluating the local power dissipation means of the chemical probe.
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